

## CLAIMS

What is claimed is:

- 1 1. A method, comprising determining a schedule for transmission times of various segments of digital content across multiple channels so as to permit any number of content consumers to begin playback of said segments of digital content from an origination point thereof within a waiting time of a request for such playback.
- 1 2. The method of claim 1 wherein the various segments of digital content together comprise a movie.
- 1 3. The method of claim 2 wherein the schedule is determined according to an earliest-deadline-first (EDF) process.
- 1 4. The method of claim 3 wherein in the EDF process a next transmission time for one of the various segments of digital content is determined by first finding an earliest deadline amongst a list of current deadlines for each of the various segments and selecting this segment for transmission.
- 1 5. The method of claim 4 wherein the earliest deadline so chosen is verified to be later than a finishing time for a last transmitted segment.
- 1 6. The method of claim 4 wherein a new deadline for transmission of the selected segment is determined according to  $T + t_i + t_d$ , where T is a beginning time for the transmission of the selected segment, i is a segment number for the selected segment,  $t_i$  is the playback time of segment i and  $t_d$  is the waiting time.

1    7. The method of claim 2 wherein a cost function is associated with each of the various  
2    segments scheduled for transmission, and a segment with the lowest of the cost functions is  
3    selected to be transmitted next.

1    8. The method of claim 7 wherein the cost function comprises wasted bandwidth.

1    9. The method of claim 2 wherein the schedule is determined according to a just-in-time (JIT)  
2    process.

1    10. The method of claim 9 wherein the JIT process schedules each of the various segments  
2    for transmission as close to a transmission deadline associated with each segment as possible.

1    11. The method of claim 10 wherein in the JIT process, conflicts for transmissions over the  
2    multiple channels are resolved by scheduling a segment with an earlier playback time closer  
3    to its deadline for transmission than a segment with a later playback time.

1    12. The method of claim 10 wherein in the JIT process, the transmission deadline associated  
2    with a particular one of the segments is determined as a time equal to a current time plus a  
3    playback time for that particular one of the segments plus the waiting time.

1    13. The method of claim 4 wherein in the EDF process, the deadlines associated with the  
2    various segments are computed according to a process wherein conflicts for transmissions  
3    over the multiple channels are resolved by scheduling a segment with an earlier playback  
4    time closer to its deadline for transmission than a segment with a later playback time.

5    14. The method of claim 2 wherein the schedule is determined according to a periodic  
6    transmission process.

1 15. The method of claim 14 wherein the periodic transmission process allows a broadcast  
2 schedule for the movie to be repeated every period time, the period time being equal to an  
3 integral multiple of a length of the movie.

1 16. The method of claim 14 wherein each one of the multiple segments is allocated to a  
2 transmission queue number of a transmission schedule table according to a number of times  
3 equal to a movie period divided by the sum of the waiting time and a playback time for such  
4 one segment.

1 17. The method of claim 15 wherein all of the segments allocated to a single one of the  
2 multiple channels form a pseudo-movie, and all such pseudo-movies for all of the multiple  
3 channels are input to multiple channels of a transmission head-end.

4 18. A method, comprising:  
5     i. dividing a multimedia presentation into sequential segments, each segment  
6         having a time length,  
7     ii. scheduling transmission of the segments of the multimedia presentation  
8         according to a schedule computed according to a specified delay time that  
9         does not depend on the time lengths of the segments, and  
10     iii. transmitting the segments over a broadcast network according to the schedule  
11         for each segment computed in step ii.

1 19. The method of claim 18 wherein a transmission bandwidth of multiple times that of the  
2 multimedia presentation is allocated for transmission of the segments and each segment is  
3 transmitted repeatedly based on the computed schedule.

1       20. The method of claim 18 wherein early segments are transmitted more frequently than  
2       later segments.

1       21. The method of claim 18 further comprising receiving the segments transmitted over the  
2       broadcast network, storing the segments in temporary storage, and playing back the segments  
3       as soon as the delay time has elapsed.

1       22. A method as in claim 18 wherein each of the segments is scheduled for repeated  
2       transmissions at periodic times.

1       23. A method as in claim 22 wherein the periodic times for transmission of each respective  
2       segments equals time offsets of the beginning of such respective segment plus an operator  
3       selected delay time.

1       24. A method as in claim 18 wherein segments having earlier transmission deadlines are  
2       scheduled first and as soon as possible.

1       25. A method as in claim 18 wherein segments are transmitted just-in-time as determined by  
2       respective time offsets and the specified delay.

1       26. A method as in claim 25 wherein in the case of a conflict where more of the segments are  
2       to be transmitted than allocated bandwidth allows, segments later in the presentation are  
3       scheduled to be transmitted earlier in nearest empty time slots, giving priority to earlier  
4       segments to be transmitted as closely as possible to their scheduled time slots.

1 27. A method as in claim 18 further comprising computing an overlap period between an end  
2 of a current presentation and a beginning of a next presentation, to minimize interruptions  
3 therebetween.

1 28. A server configured to generate transmission schedules for each of a number of segments  
2 of a multimedia presentation to be transmitted over a multiple channels of a broadcast  
3 network, said schedules computed according to a specified delay time that does not depend  
4 on time lengths of the segments.

1 29. The server of claim 28 wherein the transmission schedules are computed according to one  
2 of a just-in-time transmission (JIT) procedure, an earliest-deadline-first (EDF) procedure or a  
3 periodic transmission procedure.

1 30. The server of claim 29 wherein according to the EDF procedure a next segment to be  
2 transmitted is determined by first finding an earliest transmission deadline amongst a list of  
3 current transmission deadlines for each of the segments and selecting this segment for  
4 transmission.

1 31. The server of claim 29 wherein according to the JIT procedure each of the segments are  
2 scheduled for transmission as close to a transmission deadline associated with each segment  
3 as possible.

1 32. The server of claim 29 wherein according to the periodic transmission procedure each of  
2 the segments is allocated to a transmission queue according to a schedule that takes into  
3 account a period of the presentation, the delay time and a playback time for each segment.

1       33. A receiver configured to receive segments of multimedia presentation from multiple  
2       transmission channels simultaneously and to begin playback of the segments in a sequence  
3       corresponding to a proper format for the multimedia presentation after a predetermined delay  
4       time that is independent of time lengths of the segments.

1       34. The receiver of claim 33 wherein the segments are stored on a local storage medium.

1       35. The receiver of claim 33 wherein the segments are received according to a schedule that  
2       was computed according to one of a just-in-time transmission (JIT) procedure, an earliest-  
3       deadline-first (EDF) procedure, a combination of aspects of the EDF and JIT procedures, or a  
4       periodic transmission procedure.